

Gulf Cooperation Council

EDICT OF GOVERNMENT

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GSO 55 (1987) (English): INDUSTRIAL SAFETY AND
HEALTH REGULATIONS - HAZARDOUS MATERIALS - GASES -
PART 1: GENERAL REQUIREMENTS



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اشتراطات السلامة والصحة الصناعية

المواد الخطرة - الغازات

الجزء الأول : المتطلبات العامة

**INDUSTRIAL SAFETY AND HEALTH
REGULATIONS – HAZARDOUS MATERIALS –
GASES – PART 1: GENERAL REQUIREMENTS**

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**INDUSTRIAL SAFETY AND HEALTH
REGULATIONS – HAZARDOUS MATERIALS –
GASES – PART 1: GENERAL REQUIREMENTS**

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**INDUSTRIAL SAFETY AND HEALTH
REGULATIONS – HAZARDOUS MATERIALS –
GASES PART 1: GENERAL REQUIREMENTS**

1. SCOPE AND FIELD OF APPLICATION

This Standard is concerned with the general requirements for storage and handling of all gases which could be hazardous because of their confinement, ability to absorb, flammability or reactivity, including liquefied and cryogenic gases. Gases that are hazardous because of toxicity or poisonous nature are not covered by this Standard.

2. COMPLEMENTARY REFERENCES

- 2.1 GSO 215/1994 “Industrial Safety and Health Regulations – Equipment – Tanks, Pressure Vessels. Boilers and Compressed Gas Equipment”.
- 2.2 GSO 218/1994 “Industrial Safety and Health Regulations – Electrical Part 2: Low Voltage”.

3. GENERAL REQUIREMENTS

- 3.1 Containers - Construction and Marking
 - 3.1.1 Container shells shall be of steel construction except as noted below or as specified for any particular gas.
 - 3.1.2 Underground tanks may be made of other materials if required for compatibility of gas. Above ground tanks shall be constructed of non-combustible materials.
 - 3.1.3 Tanks or cylinders built of materials other than steel shall be designed according to Gulf Standards issued by GCC.
 - 3.1.4 All containers shall be designed, constructed and tested according to the Gulf Standard mentioned in item 2.1.
 - 3.1.5 In addition to its code stamp, each container shall be marked as follows and as specified for individual gases:
 - 3.1.5.1 With identification of its contents.
 - 3.1.5.2 With the tare weight in kg, or other identified unit of weight, for cylinders with water capacity of 140 kg or less.
 - 3.1.5.3 With the water capacity of container in kg or in litres.
 - 3.1.5.4 With a notation whether the system is designed for underground or aboveground installation or both.

3.1.5.5 With marking indicating the maximum level (liquefied gases) to which the containers may be filled except on containers with fixed level indicators, such as fixed length dip tubes, or containers that are filled by weight.

3.1.5.6 Refrigerated containers shall also be marked:

- With minimum temperature in degree Celsius for which container is designed;
- With the density of the product in kg/cu. m for which the container is designed.

3.1.5.7 Markings specified shall be on the metal nameplate attached to the container and located in such a manner as to remain visible after installation.

3.1.6 Containers shall be provided with noncombustible supports securely anchored on firm noncombustible foundations.

3.1.7 Steel supports or exposed piling in excess of 30 cm shall be protected by a protective coating having a 2-hour fire resistance rating.

3.1.8 Horizontal aboveground containers shall be mounted on saddles in such permit expansion and contraction.

3.1.9 Containers buried underground shall be placed so that the top of the container is not less than 20 cm below grade. No container shall be placed underground where it might be subject to abrasive action or physical damage due to vehicular traffic or other causes.

3.1.10 Containers shall be set on a firm foundation (firm earth may be used) and surrounded with earth or sand firmly tamped in place. Backfill shall be free from rocks or other abrasive materials.

3.1.11 Containers with supports attached (portable or semiportable containers with skids) shall not be located with the outside bottom of the container shell more than 1.5 m above the surface of the ground.

3.2 Location - Storage of Containers

3.2.1 Containers shall be stored upright and be located so that they are readily accessible to delivery equipment.

3.2.2 Systems shall not be located beneath electric power lines.

3.2.3 Systems shall not be located close to flammable liquid or other gas piping.

3.2.4 Suitable means shall be taken to prevent the accumulation of flammable liquids under containers.

3.2.5 Cylinders shall be protected against damage due to falling objects or working activity in that area.

3.2.6 Cylinders storage area shall be prominently posted with names of gases stored.

3.2.7 Cylinders shall not be exposed to continuous dampness and shall not be stored in or near corrosive atmospheres without corrosion protection.

3.2.8 Containers storing the same substance shall be stored in a segregated group. Empty containers shall be stored in the same manner.

3.2.9 Cylinders shall be stored in ventilated areas.

3.2.10 Outdoor Location

- When protective walls or roofs are provided they shall be constructed of non-combustible materials.
- Electrical equipment located within 6 m of Class 1 areas shall be installed complying with the Gulf Standard mentioned in item 2.2.

3.2.11 Buildings

3.2.11.1 Buildings shall be arranged so that at least one side is accessible for fire fighting purposes.

3.2.11.2 Doors shall be located so as to be readily accessible in case of emergency.

3.2.11.3 There shall be no sources of ignition from flames, electrical equipment or heating equipment,

3.2.11.4 Heating if provided shall be by steam, hot water or by other indirect means.

3.2.11.5 Electrical equipment shall be installed in accordance with the Gulf Standard mentioned in item 2.2.

3.2.11.6 Adequate ventilation to the outdoor shall be provided.

3.2.11.7 Interior walls shall have a fire resistance rating of at least 2 hours.

3.2.11.8 At least one wall shall be an exterior wall.

3.3 Container Valves and Accessories

3.3.1 Valves, fittings and accessories connected directly to the container including primary shutoff valves shall be of design pressure, material and construction suitable for specific gas service. Cast iron valves and accessories shall not be used. Ductile iron or malleable iron may be used except for LNG service.

3.3.2 Connections to containers, except safety relief connections, liquid level gauging devices, and plug openings shall have shutoff valves located as close to the container as practical.

3.3.3 Gauges shall be marked to indicate the type of measurement for which it is calibrated.

3.4 Protection of Container Accessories

3.4.1 Valves, regulators, gauges, and other container accessory equipment shall be protected against tampering and physical damage.

3.4.2 All pipe connections to underground containers shall be located within a dome, housing, or manhole and with access thereto protected by a cover.

3.5 Handling of Cylinders

3.5.1 Charging and transferring of content from one cylinder to another shall be done by manufacturer, distributor or authorized personnel only.

3.5.2 Tampering with safety relief devices or with any other part of cylinder shall be prohibited.

- 3.5.3 Leaky cylinders shall be located in ventilated areas with a warning sign installed on them. Supplier shall be notified and his instructions shall be followed for returning the cylinder.
- 3.5.4 Cylinders shall not be subjected to temperatures above 50°C.
- 3.5.5 Cylinders shall not be used as rollers, supports or any other purposes.
- 3.5.6 Cylinder valve shall be closed except when in use.
- 3.5.7 Where removable caps are provided for valve protection, such caps shall be kept on cylinders at all times except when cylinder is in use.
- 3.5.8 Cylinders shall not be lifted by cap.
- 3.5.9 Cylinders shall not be dropped or struck against each other.
- 3.5.10 Cylinders shall not be handled with lifting magnets. Slings, ropes, or chains shall not be used on the cylinders unless provisions have been made for lifting attachments.
- 3.5.11 Dragging of cylinders shall not be permitted.
- 3.5.12 Cylinder valve shall be opened slowly pointing away from operator.
- 3.5.13 Wrenches or levers shall not be used on valves with handwheel. Valves shall never be forcefully opened. If a valve is difficult to open, supplier shall be contacted.
- 3.5.14 Cylinders of liquified gases, shall be transferred or stored in vertical position.

3.6 Piping Systems

- 3.6.1 Materials selected for piping shall be compatible with gas service for which they are used.
- 3.6.2 Piping shall be designed, fabricated, installed and tested in accordance with relevant Gulf Standards.
- 3.6.3 Joints in piping shall be welded, soldered, flanged, or brazed, with limitations, if any, as specified in items for individual gases.
- 3.6.4 Before erection, all piping shall be thoroughly cleaned of oil, grease, other oxidizable materials or foreign matter using a proper solution or solvent which will not react with gas.
- 3.6.5 All pipe lines containing flammable, combustible, corrosive, or toxic substances shall be readily identified by labeling or marking with the name of gas.
- 3.6.6 Piping shall be supported and protected against physical damage. Buried pipes shall be protected against corrosion.
- 3.6.7 Where condensation may occur in the piping, the piping shall be pitched back to the container or suitable means shall be provided for evaporation of the condensate.
- 3.6.8 Means shall be provided to minimize exposure of personnel to piping operating at low temperatures. Only those insulating materials which are rated nonburning may be used. The insulation shall be designed to have a vapourtight seal in the outer covering to prevent the condensation of air and subsequent oxygen

enrichment within the insulation. The insulation material and outside shield shall also be of adequate design to prevent attrition of the insulation due to normal operating conditions.

- 3.6.9 Uninsulated piping and equipment which operate at cryogenic temperature shall not be installed above asphalt surfaces or other combustible materials in order to prevent contact of liquid air with such materials.
- 3.7 Safety Relief Valves
 - 3.7.1 Discharge shall be upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gases upon the container, adjacent structure or personnel.
 - 3.7.2 Discharge terminals shall be so located as to provide protection against physical damage. Return bends and restrictive pipe bends shall not be permitted.
 - 3.7.3 Design or location shall be such that moisture cannot collect in a manner which would obstruct the proper operation of device.
 - 3.7.4 Safety relief devices shall have direct communication with the vapour space of container at all times.
 - 3.7.5 Devices shall be arranged so that possibility of tampering will be minimized.
 - 3.7.6 Safety relief valve assemblies, including their connections, shall be sized so as to provide the rate of flow required for the container on which they are installed.
 - 3.7.7 Shut off valves shall not be installed between the safety relief devices and the container or piping, except that a shut off valve may be used where the arrangement of this valve is such that full required flow through the safety relief devices is always afforded.
- 3.8 Liquid Level Gauging Devices
 - 3.8.1 Each container used in liquefied gas handling, except those filled by weight, shall be equipped with a liquid level gauge to indicate maximum permitted filling level.
 - 3.8.2 Gauging devices that require bleeding of the product to the atmosphere, such as the rotary tube, fixed tube, and slip tube, shall be designed so that the bleed valve maximum opening is not larger than a 1.5 mm diameter, unless provided with excess flow valve.
 - 3.8.3 Gauging glasses of the columnar type shall be restricted in use as specified in different specific gas items. They shall be equipped with shut off valves having metallic hand wheels with excess flow valves and with extra heavy glasses protected with a metal housing applied by the gauge manufacturer when permitted for use. They shall be shielded against the direct rays of the sun.
- 3.9 Vaporizers and Vaporizer Housing
 - 3.9.1 Indirect Fired Vaporizers
 - 3.9.1.1 Vaporizers shall be constructed in accordance with applicable requirements of item 2.1.
 - 3.9.1.2 Vaporizer having an inside diameter of 15 cm or more shall also be marked with outside surface area and the inside heat exchange surface area in square metres.

3.9.1.3 Heating or cooling coils shall not be installed inside a storage container.

3.9.1.4 Vaporizers may be installed in buildings, rooms, sheds, lean-tos or in other structures of noncombustible construction, used exclusively for gas manufacturing or distribution, when well ventilated near the floor line and highest point of the roof.

3.9.1.5 When vaporizing and/or mixing equipment is located in a structure or building not used exclusively for gas manufacturing or distribution, either attached to or within such a building, such structure or room shall be separated from the remainder of the building by a wall designed to withstand a static pressure of at least 50,000 kPa (500 kg/sq cm). This wall shall have no openings or pipes or conduit passing through it. Such structure or room shall be provided with adequate ventilation and shall have a roof or at least one exterior wall of lightweight construction.

3.9.1.6 The heating medium lines into and leaving the vaporizer shall be provided with suitable means for preventing the flow of gas into the heat systems in the event of tube rupture in the vaporizer. Vaporizers shall be provided with suitable automatic means to prevent liquid passing through the vaporizers to the gas discharge piping.

3.9.1.7 The device that supplies the necessary heat for producing steam, hot water, or other heating medium location shall be separated from all compartments or rooms containing gas vaporizers, pumps, and central gas mixing devices by a wall designed to withstand a static pressure of at least 50,000 kPa (500 kg/sq cm). This wall shall have no openings or pipes or conduit passing through it.

3.9.1.8 Vaporizers shall not be equipped with fusible plugs.

3.9.1.9 Open flames or other sources of ignition shall not be permitted in vaporizer rooms except in those housing direct-fired vaporizer.

3.9.2 Atmospheric Vaporizers.

These employ heat from the ground or surrounding air and shall be installed as follows: Buried underground, or located inside the building close to a point at which the pipe enters the building provided that the capacity of the unit does not exceed one litre/hr.

3.9.3 Direct Gas-Fired Vaporizers

3.9.3.1 Vaporizers shall be marked with the name of the manufacturer; rated input to the burner; the area of the heat exchange surface in sq. m; the outside surface of the vaporizer in sq. m and the maximum vaporizing capacity in litres/hr.

3.9.3.2 Vaporizers may be connected to the liquid section or the gas section of the storage container, or to both; but in any case there shall be at the container a manually operated valve in each connection to permit complete shut off when desired.

3.9.3.3 Vaporizers with a capacity not exceeding 15 litres/hr shall be located at least 1.5 m from container shut-off valves. Vaporizers having a capacity of more than 15 litres but not exceeding 380 litres/hr shall be located at least 3 m from the container shut-off valves. Vaporizers having a capacity greater than 380 litres/hr shall be located 4.5 m from container shut-off valves.

3.9.3.4 Vaporizers shall have a safety relief valve at or near the discharge. The relief valve shall be so located as not to be subjected to temperatures in excess of 60°C.

3.9.3.5 Vaporizers shall be provided with means for manually turning off the gas to the main burner and pilot.

3.9.3.6 Vaporizers shall be equipped with automatic safety devices to shut off the flow of gas to main burners if the pilot lamp should fail. When the flow through the pilot exceeds 500 kilo calories/hr, the pilot also shall be equipped with an automatic safety device to shut off the flow of gas to the pilot if the pilot flame should be extinguished.

3.9.3.7 Pressure regulating and pressure reducing equipment, if located within 3 m of a direct fired vaporizer, shall be separated from the open flame by a substantially airtight noncombustible partition or partitions.

3.9.3.8 The following minimum distances shall be maintained between direct fired vaporizers and the nearest important building or group of buildings or line of adjoining property which may be built upon: 3 m for vaporizers having a capacity of 60 litres/hr or less vaporizing capacity, 8m for vaporizers having a vaporizing capacity of 60 to 380 litres/hr, 15 m for vaporizers having a vaporizing capacity exceeding 380 litres/hr.

3.9.3.9 Direct fired vaporizers shall not be permitted in gas pump houses or gas container charging rooms.

3.9.3.10 Direct fired vaporizers shall not raise the gas pressure above the design pressure of the vaporizer equipment.

3.9.3.11 Direct gas-fired tank heaters, and the tanks to which they are applied, shall only be installed above ground.

3.9.3.12 Tank heaters shall be permanently marked with the name of the manufacturer the rated kilo calories, input to the burner, and the maximum vaporizing capacity in litres/hr.

3.9.3.13 Tank heaters shall be provided with a means for manually shutting off the gas to the main burner and pilot.

3.9.3.14 Tank heaters shall be equipped with an automatic safety device to shut off the flow of gas to main burners if the pilot light should fail. The pilot light also shall be equipped with an automatic safety device to shut off the flow of gas to the pilot light the pilot flame (should be extinguished) when flow through pilot light exceeds 500 kilo calories/hour.

3.9.3.15 Pressure regulating and pressure reducing equipment shall be separated from the open flame by a substantially airtight noncombustible partition if located within 3 m of a direct fired tank heater.

3.9.3.16 The following minimum distances shall be maintained between a storage tank heated by a direct fired tank heater and the nearest important building or group of buildings or line of adjoining property which may be built upon: 3 m for storage containers of less than 1900 litres water capacity, 8 m for storage containers of 1900 litres to 4550 litres water capacity, 15m for storage containers of over 4550 litres water capacity.

3.9.4 Vaporizer - Burners

3.9.4.1 Where used for dehydrators or dryers, shall be located outside the buildings.

3.9.4.2 Vaporizer-burners shall have a minimum design pressure of 1765 kPa with a factor of safety of five.

3.9.4.3 Manually operated positive shut-off valves shall be located at the containers to shut off all flow to the vaporizer-burners.

3.9.4.4 Minimum distances between storage containers and vaporizer-burners shall be as follows:

Water Capacity per Container (Litres)	Minimum Distances (Metres)
Less than 1900	3
1901 to 7500	8
Over 7500	15

3.9.4.5 The vaporizer section of the vaporizer-burners shall be protected by a hydrostatic relief valve. The relief valve shall be located so as not to be subjected to temperatures in excess of 60°C. The start-to-discharge pressure setting shall be such as to protect the components involved, but it shall be not less than 1765 kPa.

3.9.4.6 Vaporizer-burners shall be provided with means for manually turning off the gas to the main burner and pilot.

3.9.4.7 Vaporizer-burners shall be equipped with automatic safety devices to shut off the flow of gas to the main burner and pilot in the event the pilot is extinguished.

3.9.4.8 Pressure regulating and control equipment shall be located or protected so that the temperatures surrounding this equipment do not exceed 60°C except that equipment components may be used at higher temperatures if designed to withstand such temperatures.

3.9.4.9 Pressure regulating and control equipment when located downstream of the vaporizer shall be designed to withstand the maximum discharge temperature of the vapour.

3.9.4.10 Vaporizer coils or jackets shall be made of ferrous metal or high temperature alloys.

3.9.4.11 Equipment utilizing vaporizer-burners shall be equipped with automatic shut-off devices upstream and downstream of the vaporizer section connected so as to operate in the event of excessive temperature, flame failure, and, if applicable, insufficient airflow.

3.10 Transfer of Liquids

3.10.1 At least one attendant shall remain close to the transfer connection from the time the connections are first made until they are finally disconnected, during the transfer of the product.

3.10.2 Containers shall be filled or used only upon authorization of the owner.

3.10.3 Containers shall be gauged and charged only in the open atmosphere or in buildings or areas provided for that purpose.

3.10.4 Loading and unloading systems shall be protected by suitable devices to prevent emptying of the storage container or the container being loaded or unloaded in the event of severance of the hose. Backflow check valves or properly sized excess flow valves shall be installed where necessary to provide such protection. In the event that such valves are not practical, remotely operated shut-off valves shall be installed.

3.11 Loading or Unloading of Tank Car or Transport Truck

3.11.1 The track of tank car siding shall be relatively level.

3.11.2 A "Tank Car Connected" or "Stop Men at Work" sign shall be installed at the active end or ends of the siding while the tank car is connected. In addition, derail shall be placed between the sign and tank car.

3.11.3 Only properly designed and marked cars shall be used for transportation.

3.11.4 Safe procedures for, handling cylinders, specified in item 3.5 shall be followed.

3.11.5 While cars are on sidetrack for loading or unloading, the wheels at both ends shall be blocked on the rails.

3.11.6 Cars shall be electrically grounded before unloading if the content is flammable.

3.12 Electrical Equipment.

Electrical equipment and wiring shall be of the type specified and shall be installed in accordance with the Gulf Standard mentioned in item 2.2.

3.13 Maintenance.

The equipment and functioning of each system shall be maintained in safe operating condition in accordance with this standard.